

MODULE INFORMATION SHEET

Name of Module Unit	Physics
Name in polish language	Fizyka
Module type	compulsory
Form of studying	full-time day courses
Level of study	undergraduate course (B.Sc. level)
Type of study (for extra-mural courses)	-
Programme	Environmental Engineering
Speciality	Environmental Engineering
Responsible department	Faculty of Physics
Responsible person	Dr Wojciech Gębicki

Semester	Lectures(E)	Tutorials	Laboratory	Computer Exercises	Projects	ECTS
2	15		30			5

Objectives (summary)

The objective of the subject (compulsory optional) is to acquaint students with physical phenomena and to teach the skills of understanding and to make use of the gained knowledge to solve technical and everyday life tasks. Another objective is to teach students the skills of correct definition and measurements of physical phenomena. The issues covered by the module are electricity, electromagnetic field, geometrical and physical optics, and elements of modern physics on basic level. The objective of the module is to teach student an understanding of classical physics combined with limited information on modern physics. Basic practical training in experimental physics at the physical laboratory gives students an opportunity to organize simple physical experiment as well as to link the theory with applications and practical experiment.

Prerequisites

none

Rules of integrated grade setting

First semester $0.7(\text{exam note}) + 0.3(\text{laboratory note})$

Recommended readings

Halliday, Resnick, Walker: *Fundamentals of Physics*
Further lecture position will be discussed with students

Contents of lectures (syllabus)

	Topics	Time (hrs.)	Scope (S / Ex)
1	Coulomb's law. Field E. Electric dipole Electric flux. Gauss's law for field E. Applications of Gauss's law for calculating field E. Electric potential. Equipotential surfaces. Potential gradient vs. field E.	2	S
2	Electric capacitance. Capacitor. Applications of Gauss's law for calculating capacitance of capacitors. Energy of charged capacitor. Dielectrics – vectors E, D and P. Generalized Gauss's law. Electric current. Resistance R. Electromotive force.	2	S
3	Lorentz force. Definition of magnetic field B. Conductor in field B. Loop in field B. Sources of magnetic field – magnetic field of a point charge with constant velocity. Accelerators	2	S
4	Ampere's law. Field B of a current element. Law of Biot and Savart. Electric current loop. Magnetic dipole. Bohr's magneton. Properties of magnetic materials. Paramagnetic, diamagnetic and ferromagnetic materials. Hysteresis loop. Curie temperature.	2	S
5	Displacement current and magnetic field of displacement current. Generalized Ampere's law. Electromagnetic induction. Faraday's law. Lenz's law. Inductance. Energy of field B, Circuits RL, LC and RLC	2	S
6	Maxwell's equations – differential and integral forms Electromagnetic waves – wave equation from Maxwell's equations. Speed of electromagnetic waves.	2	S
7	Elements of wave optics. Spectrum of EM radiation Incidence, reflection and refraction of light. Dispersion. Rainbows Diffraction and interference of light. Polarization of light.	2	S
8	Coherence of light. Principles of a laser. Holography.	1	Ex
Total		15	hours

S – topics listed in the legal study programme standards from 12.07.2007

Ex – extended topics

Lecturers

Dr Wojciech Gębicki

Assessment method

Test

Contents of laboratory

	Topics	Time (hrs.)	Scope (S / Ex)
1	Measurements methods and methods of report preparation. Statistical analysis of errors. (lecture + demonstration)	3	S
2	Simple harmonic oscillations. Reversion and torsion pendulum.	3	S
3	Laminar transport of liquids. Measurement of viscosity coefficient.	3	S
4	Heat conduction of metals. Estimation of thermal conductivity coefficient.	3	S

5	Magnetic properties of solids. Estimation of Curie temperature.	3	S
6	Vibrations in electric circuits.	3	S
7	Measurements of visible light wavelength with diffraction grating and optical spectrometer.	3	S
8	Wave properties of particles. Verification of de Broglie hypothesis.	3	Ex
9	Determination of Planck's constant. I-V characteristics of laser diode.	3	Ex
Total		30	hours

S – topics listed in the legal study programme standards from 12.07.2007

Ex – extended topics

Persons responsible for laboratory

To be determined

Assessment method for laboratory

Reports and their successful defend

Remarks

Every student prepares his own report. The important point of the report is short but exact definition of the observed physical phenomena and its understanding, correct measurement procedure applied, honest and correct estimation of the experimental errors.